Industry Skills Standards

Jobs and Skill Requirements
for Entry-Level Workers
2000-2005

Technologies: Manufacturing, Communications & Repair

A project of the
Connecticut Business & Industry Association,
in collaboration with the
School-to-Career Partnership
of the State Departments of Education, Higher Education and Labor.

An Introduction to the
Technologies: Manufacturing, Communications, and Repair Cluster

Manufacturing, Communications, and Repair" cluster covers a broad range of industries that require employees with a technical background. Included are technical jobs in manufacturing, the electric utilities, and the telephone and cable companies. This cluster also includes jobs in companies that repair automobiles, airplanes, computers and other technical products, as well as companies that develop computer software.

Some of these industries are creating new jobs in the state; others, such as traditional manufacturing, continue to need trained people to replace those who are retiring or leaving. New, usually small, manufacturing firms need to add employees with technical skills. Communications companies depend upon hiring employees with a technical background or specialized training, to repair sophisticated equipment, including cars and computers.

Although this cluster contains a great many different jobs, the high school background for all of them includes courses in math, the physical sciences, technology, communications and using computers. A student interested in the actual manufacturing process might add courses in manufacturing technology, electronics, computer-aided machining (CAM) or computer-aided drafting (CAD).

Companies in this cluster, whether they are making airplanes or installing telephones, also require employees with management, business and office skills, as well as people with technical skills.

Something to Consider

Industries that depend on workers with technical knowledge are undergoing a great deal of restructuring at present. In some cases, they are laying off or retiring workers. Nevertheless, there is still potential for people with up-to-date technical skills in the older, larger companies, and there is even more potential for work in the newer, smaller companies that are an important part of the Connecticut economy. Our economy, and the wealth of the state, depend upon a technical work force.

Working in technical jobs often appeals to people who enjoy figuring out how things work, who like solving practical problems, who can think about developing new techniques and products, or who have a special interest in computers and the way they work.

Some Examples of What a Student Might Do

Engineers and engineering technicians design, develop, test and help manufacture machines, consumer products, computer software, communication systems and many other things.

Technicians of many kinds — for example, those in engineering, communications, electronics, manufacturing, environmental businesses, facilities systems and graphic arts — are in great demand in the state. Most of these jobs require less than four years of college, but do require completion of courses or programs in the community/technical college system.

People in ***technical sales and marketing*** act as industry experts,

consultants and problem solvers when selling their firms' products and services. They need to have considerable knowledge of their product, sales and communications skills, and some technical skills.

Mechanics, installers and repairers have a technical background but will usually specialize in one type of work, such as aircraft, autos, air-conditioning and computers. Often they will inspect and diagnose problems and determine the best ways to correct them.

Machinists in precision production produce metal parts and plastic molds using machine tools such as lathes, drill presses and milling machines. Today's machinists must have a working knowledge of computers and be able to use and program computer software. The market offers many opportunities to machinists with up-to-date skills. Most ***printing press operators*** also need to have computer skills, and are involved with the publication of books, magazines and newspapers.

TECHNOLOGIES: MANUFACTURING, COMMUNICATIONS, AND REPAIR CLUSTER

JOB CATEGORIES AND SELECTED JOB TITLES

Manufacturing, communications and repair professionals have identified the job categories and titles they project will be in demand over the next five years. Education level requirements are indicated for each job requirement so those students can plan their coursework accordingly. However, there is some flexibility within these educational guidelines. What is checked represents the minimum amount of education required.

Facilities/Environment Maintenance

Primary Function: Perform routine preventive maintenance and repair of production process equipment and systems of the physical facility. Keep the facility's operations at full production level, in compliance with existing regulations for safety and health, environmental protection and fire prevention.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Compliance Technician		X		
Environmental Systems/Maintenance Operator		X		
Environmental and Safety Compliance Technician		X		
Facilities Systems Technician		X		
Maintenance Mechanic		X		

Communications

Primary Function: Prepare high-quality graphics publications to enhance ideas and concepts; gather, organize and present material through staff development and technical support activities; put scientific and technical information into readily understandable language; review printed material, and conduct extensive research by interviewing staff.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Graphic Arts Technician		X		
Publications Writer/Editor			X	
Technical Writer			X	
Video Technician		X		

Customer Service

Primary Function: Ensure that a positive, long-term relationship exists between the customer and the business. Address customer needs and ensure customer satisfaction by providing and supporting cost-effective solutions.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Customer Service Representative*		**X**		
Sales Assistant*		**X**		
Marketing Assistant*		**X**		

Production/Assembly

Primary Function: Make, package and ship products according to quality standards; make minor adjustments and repairs to equipment according to safety standards.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Basic Pack/Assembler	**X**			
Electronic Worker	**X**			
Machine Operator	**X**			
Warehousing Person	**X**			
Welder Operator	**X**			

Product Design and Process Development

Primary Function: Develop, improve, or design products and processes through analysis and testing.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Chemist*			**X**	
Chemical Engineer*⌘				**X**
Electrical and Electronic Engineer			**X**	
Industrial Engineer*⌘			**X**	
Manufacturing Engineer			**X**	
Mechanical Engineer*⌘			**X**	
Pharmacologist (Ph.D. Preferred)*				**X**
Process Engineer*⌘			**X**	
Product Design Engineer*⌘				**X**
Project Engineer*⌘			**X**	
Research and Design Engineer				**X**

***** *= appears in other clusters*

⌘ *= certification required for upward mobility*

Skilled Machine Trades

Primary Function: Fabricate and maintain parts/machine tooling for production and/or repair.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Machinist	**X**			
Machine Repair	**X**			
Millwright	**X**			
Pattern/Mold Maker	**X**			
Tool and Die Maker	**X**			
Welder	**X**			

Technician

Primary Function: Maintain, repair, troubleshoot, install and operate computer-based electronic equipment.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Automotive Repair Person	**X**			
CAD Technician	**X**			
Communications Technician		**X**		
Electronics Technician		**X**		
Engineering Technician		**X**		
Equipment/Installation Technician	**X**			
Lab Technician		**X**		
Manufacturing Technician		**X**		
Service/Repair/Maintenance Technician	**X**			
Transportation Services Technician	**X**			
Quality Assurance Technician		**X**		

Health and Safety

Primary Function: Establish health and safety standards in the workplace based on scientific knowledge and legal requirements.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Occupational Health and Safety Technologist*			**X**	
Pollution Control Engineer/Consultant*				**X**
Safety Engineer⌘			**X**	

***** *= appears in other clusters*

⌘ *= certification required for upward mobility*

Sales and Marketing

Primary Function: Sell and market goods or services that require a technical background.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
International Sales and Marketing			**X**	
Marketing Specialist*			**X**	
Sales Representative (scientific and technical)			**X**	
Sales Supervisor (scientific and technical)			**X**	
Sales Engineer			**X**	

Financial Specialists

Primary Function: Plan and administer accounting services, consult on tax issues, and provide budget analysis and mortgage approval. Some may trade on the foreign exchange markets.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Accountant*⌘			**X**	
Financial Analyst*⌘				**X**
Financial Manager*⌘			**X**	

Information Technology

Primary Function: Analyze business, scientific and technical information for application to electronic data processing systems.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Computer Engineer*				**X**
Information Systems Analyst*				**X**
Management Information Systems Manager*				**X**
Programmer*			**X**	
Software Engineer*				**X**

***** *= appears in other clusters*

⌘ *= certification required for upward mobility*

Legal/Regulatory

Primary Function: Provide legal advice on product liability, patents and environmental law. Advise on international, national and state laws, or actively lobby to protect financial interests.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Attorney (patents, Engineering, Labor, ERISA, Employment law)*				**X**
Government Affairs Consultant*			**X**	

Management

Primary Function*:* Plan and direct long and short term goals, strategies and activities to improve product quality, sales and marketing and profits. Also address employment and training needs.

Job Title	H.S. Diploma	A.S.	BA/BS	Masters+
Employee Benefits Consultant*			**X**	
Employee Relations Manager*			**X**	
Human Resources Manager*			**X**	
Operations and Systems Analyst (master's preferred)			**X**	
Procurement Manager (Distribution & Transportation)			**X**	
Production Supervisor/Manager			**X**	
Quality Engineer			**X**	
Training and Development Director*			**X**	

***** *= appears in other clusters*

⌘ *= certification required for upward mobility*

Technologies: Manufacturing, Communications, and Repair Cluster (High School or Associate's)

Technical Skills	Facilities Maintenance	Communi-cations	Production Assembly	Customer Service	Skilled Machine Trades	Technician
Data Measurement Analysis						
Interpret values from test equipment	X		X			X
Interpret measuring instruments	X		X		X	X
Interpret electrical and mechanical blueprint specifications	X				X	X
Interpret setup charts	X	X	X		X	X
Interpret data-gathering charts, scatter diagrams, pareto diagrams, histograms and statistical charts			X		X	X
Estimate materials and volume	X				X	X
Interpret results from quantitative data	X				*X*	
Interpret two-dimensional drawings	X	X			X	X
Determine quality level to decide whether or not to continue	X		X		X	X
Apply OSHA safety and hazardous material regulations to job tasks	X	X	X	X	X	X
Apply electrical and mechanical variables measurement principles, including the concepts of accuracy, repeatability and process tolerance, to job tasks	X				X	X
Apply line and work station setup and machine capability to job tasks					X	X
Maintain inventory levels, quality, availability and flow	X				X	X
Write test reports	X	X				X
Prepare service bills				X		X
Maintain a discipline laboratory notebook that thoroughly and accurately describes experimental concepts, setup, procedures and results obtained					X	X
Write a technical report that summarizes an experiment						X

Complete a status report and machine log	X		X		X	X
Record data during the fabrication process			X		X	X

Technologies: Manufacturing, Communications, and Repair Cluster (High School or Associate's)

Technical Skills	Facilities Maintenance	Communi-cations	Production Assembly	Customer Service	Skilled Machine Trades	Technician
Apply legal requirements and government regulations to job tasks	X	X		X		
Identify and obtain sources of information about customer needs		X	X	X	X	
Monitor quality and improvement processes	X	X	X	X	X	X
Investigate product/process deviation and root cause of deviation	X	X			X	X
Build processes and prototypes according to internal product design, engineering instructions and customer specifications	X				X	X
Set quality criteria and test outcome against criteria		X			X	X
Mathematics/Science:						
Apply trigonometric principles to job tasks						X
Apply calculus principles to job tasks						X
Identify trends from data	X				X	X
Apply physics principles associated with mechanics, pneumatics, hydraulics, electronics and electricity to job tasks	X				X	X
Use programmable controls	X					
Use mechanical measuring equipment, including scales, calipers, verniers and dial indicators to measure both linear and circular dimensions			X		X	X
Use electrical measuring equipment and devices, including volt, ampere and ohm meters, oscilloscopes, and frequency counters to take basic measurements of electrical circuit performance	X				X	X
Set up equipment	X		X		X	X
Perform electrical soldering	X					X
Set up and operate simple machine tools such as a lathe, vertical mill, drill press, saw, Bridgeport and surface grinder					X	
Select tool types based on materials and features to be machined					X	

Technologies: Manufacturing, Communications, and Repair Cluster (High School or Associate's)

Technical Skills	Facilities Maintenance	Communi-cations	Production Assembly	Customer Service	Skilled Machine Trades	Technician
Use offsets to finish setup and begin operation					X	
Demonstrate mechanical aptitude	X				X	X
Test equipment	X		X			X
Troubleshoot and repair equipment and/or recommend improvements	X				X	X
Computer Knowledge						
Apply computer concepts to job tasks such as customer service tracking, data entry, graphic design/layout newsletters		X		X		
Personal Attributes						
Strong work ethic, including attention to attendance and punctuality	X	X	X	X	X	X
Ability to perform many tasks	X	X	X	X	X	X
Ability to learn	X	X	X	X	X	X
Ability to be flexible	X	X	X	X	X	X